higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T490**(E)**(A8)T

# NATIONAL CERTIFICATE: MULTI-DISCIPLINARY DRAWING OFFICE PRACTICE

# ELECTRICAL DRAUGHTING

(8080625)

**8 August 2018 (X-Paper)**
**09:00–13:00**

**REQUIREMENTS: A4 drawing sheets**

**Calculators, drawing instruments and computer-aided draughting equipment and related software may be used.**

**This question paper consists of 8 pages.**

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# DEPARTMENT OF HIGHER EDUCATION AND TRAINING
# REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE: MULTI-DISCIPLINARY DRAWING OFFICE PRACTICE
ELECTRICAL DRAUGHTING
TIME: 4 HOURS
MARKS: 100

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**INSTRUCTIONS AND INFORMATION**

1. Answer ALL the questions.

2. Read ALL the questions carefully.

3. Number the answers according to the numbering system used in this question paper.

4. Marks will be allocated for:

   4.1 Balanced layout and size
   4.2 Correctness
   4.3 Lettering
   4.4 Line work and neatness

5. Answer ALL questions (theory and drawings) on DRAWING SHEETS (no separate ANSWER BOOK is required for answering any of the questions).

6. Write neatly and legibly.

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## QUESTION 1: GENERAL THEORY

1.1 List the conductor sizes (in $mm^2$) that are suitable for each of the following circuits or subcircuits in a small household electrical installation:

1.1.1 Main supply

1.1.2 Cooking appliance (stove)

1.1.3 Geyser

1.1.4 Socket outlets (power points)

1.1.5 Illumination (lights)

(5 × 1) (5)

1.2 Name THREE factors that determine the electrical resistance of a conductor. (3)

1.3 A three-phase transformer has a maximum rating (S) of 250 kVA.

Calculate the maximum line current that should not be exceeded if the line voltage is 400 V.

Hint: $S = \sqrt{3} \times V_L \times I_L$ (3)

1.4 Explain the term *stroboscopic effect* and give ONE practical example of this phenomenon. Also explain a risk (danger) associated with it and how it can be reduced. (4)

1.5 Copy and complete the following table of electrical quantities and standard units.

| ELECTRICAL QUANTITY | STANDARD UNIT |
|---|---|
| 1.5.1 | H |
| 1.5.2 | Hz |
| Reactance | 1.5.3 |
| Impedance | 1.5.4 |
| Energy | 1.5.5 |

(5)
**[20]**

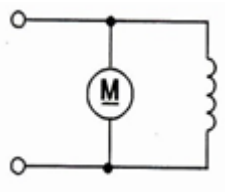
## QUESTION 2: GRAPHICAL SYMBOLS AND ELECTRONIC DIAGRAMS

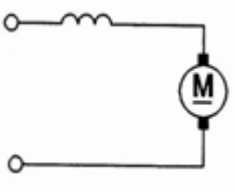
Below are electrical graphical symbols that are commonly used in multiline electrical diagrams.

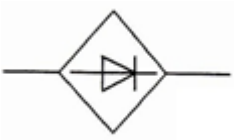
Redraw the given symbol next to the question number (2.1–2.10) and write the correct complete name or description for each symbol below each drawing. Symbol names or descriptions should comply with applicable IEC standards.

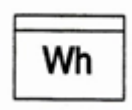
2.1 

2.2 

2.3 


2.4 

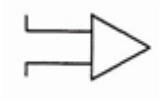

2.5 

2.6 


2.7 

2.8 

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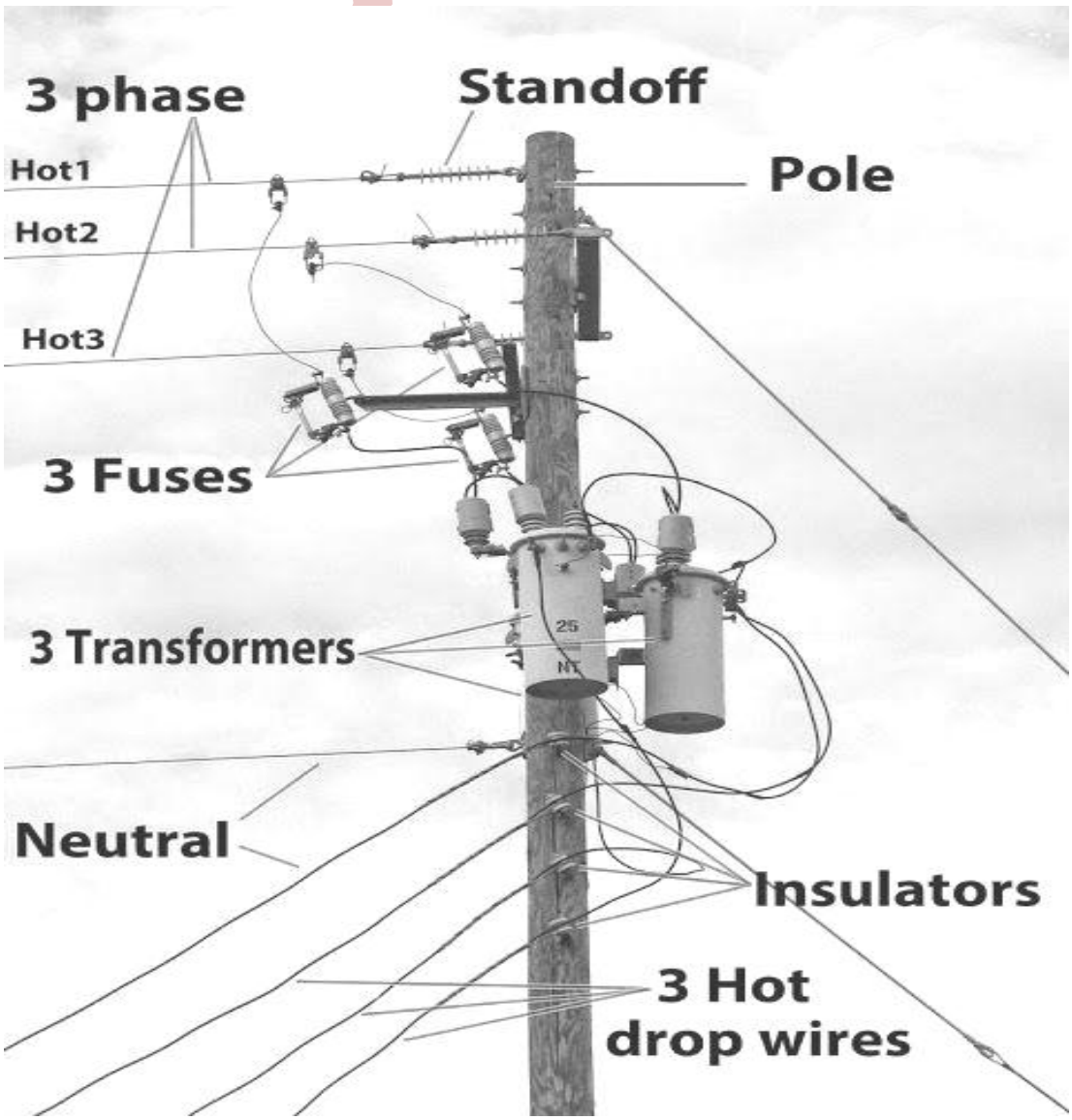
2.9 

2.10 

(10 × 2) **[20]**

**QUESTION 3: GENERATION AND DISTRIBUTION OF ELECTRICITY**

The photograph below shows the components of a delta-star pole-mounted transformer.



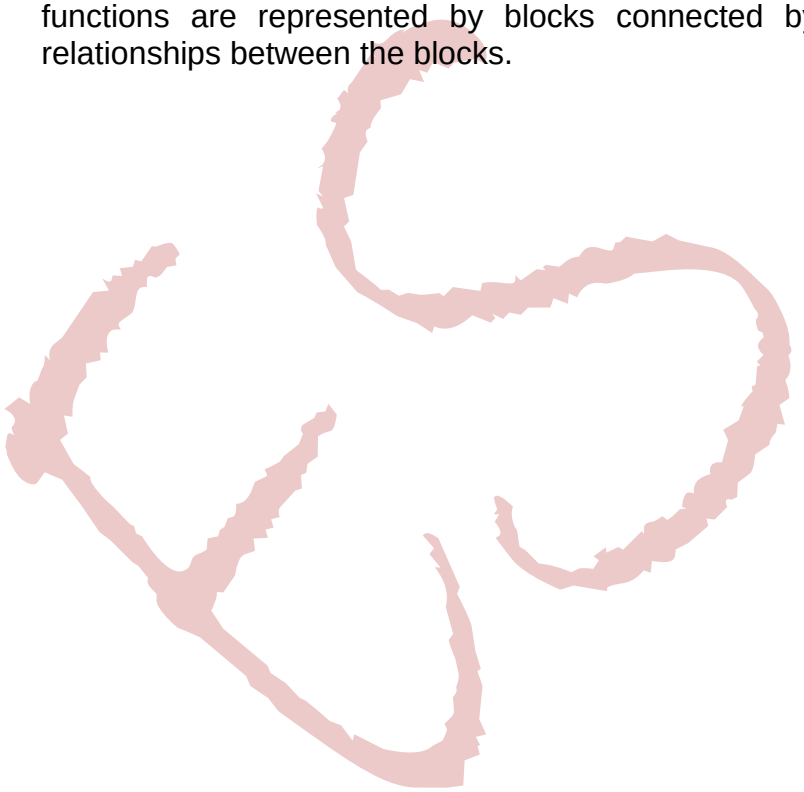

[Source: *https://www.allaboutcircuits.com/*]

Draw a fully labelled block diagram of this system.

The drawing must include the following:

| | |
|---|---|
| Transmission line (HT) | 3 × transformers |
| Stand-off insulator | Low-tension line (LV) |
| Connection points | Neutral |
| 3 × fuses | Earth connection |

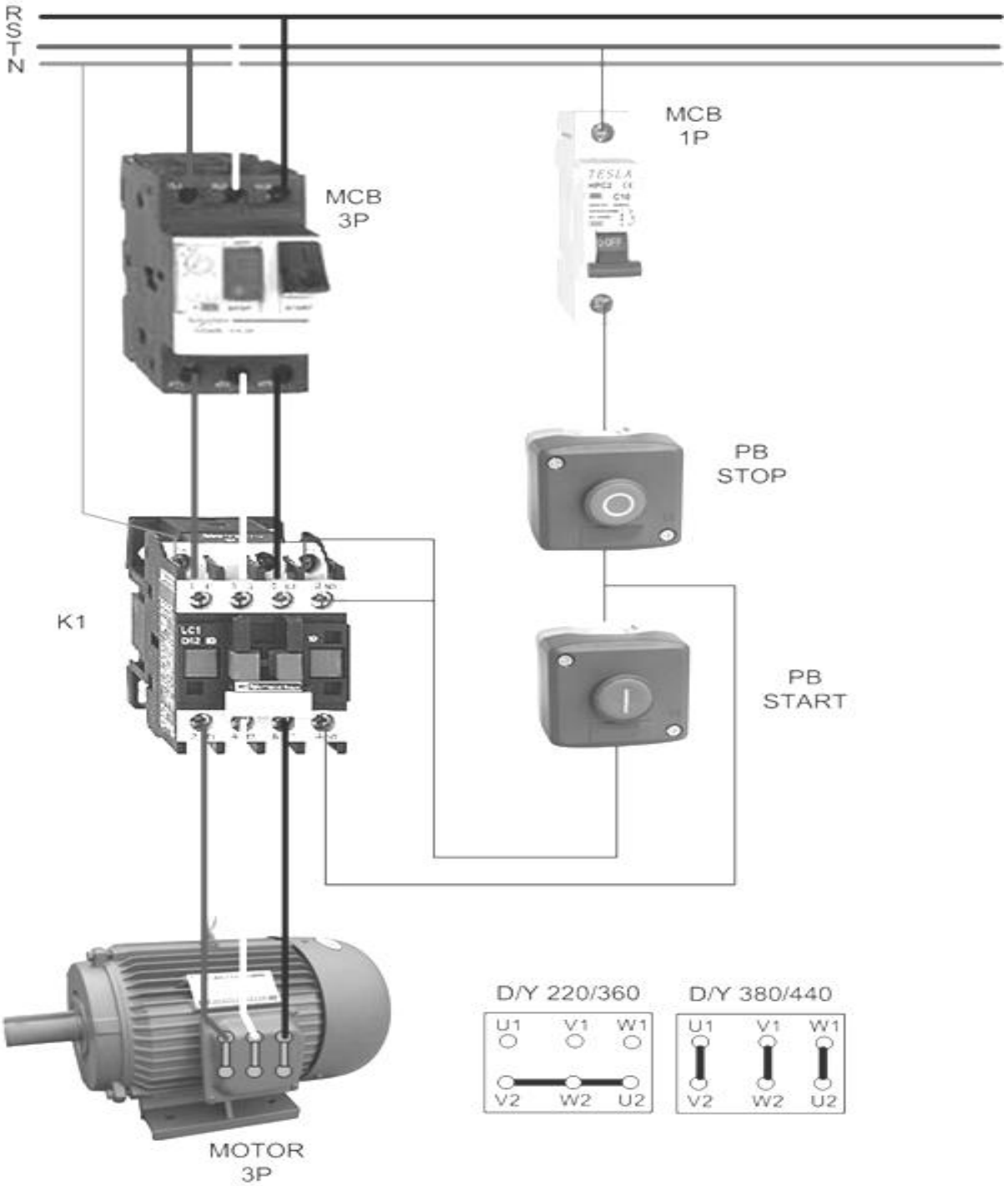
**NOTE:** A block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines to show the relationships between the blocks. **[20]**



## QUESTION 4: ELECTRICAL MOTORS AND CONTROL DEVICES

The photograph below shows the components of a direct-on-line-starter used to control an electrical three-phase motor.

Draw the complete circuit and, where possible, improve the circuit layout. Draw the main (power) circuit and the control circuit separately (as given) and improve/complete the item designation so that the final drawing will be ready for reproduction.




[Source: *http://electrical-eng-world.blogspot.co.za*] **[20]**

## QUESTION 5: WIRING OF PREMISES

Draw a plan view, wiring diagram and single-line diagram for the following light-switch applications. NO detailed drawing of the building/application is required. Add ALL necessary electrical points on the plan. Take applicable regulations from SANS codes of practice into account. The drawing must be accompanied by a legend/key of the electrical installation symbols.

5.1 FIVE lights controlled by using TWO switches – ONE switch must control THREE lights and the other switch must control the other TWO lights (7)

5.2 THREE lights controlled by using TWO switches – the lights must be switched on or off by any of the switches (6)

5.3 FOUR lights controlled by using THREE switches – the lights must be switched on or off by any of the switches (7)

**[20]**

**TOTAL: 100**

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